



Dragonflies and damselflies (Odonata) from Córdoba and San Luis provinces, Argentina

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Abstract

Nineteen geographical records for species of Odonata in 2 provinces of Argentina are documented. We provided records for 9 newly recorded species for Córdoba: *Lestes spatula* Fraser, 1946, *Andinagrion peterseni* (Ris, 1908), *Argentagrion ambiguum* (Ris, 1904), *Erythemis attala* (Selys in Sagra, 1857), *Erythemis plebeja* (Burmeister, 1839), *Erythrodiplax media* Borrer, 1942, *Micrathyria longifasciata* Calvert, 1909, *Micrathyria hypodidyma* Calvert, 1906, and *Tramea cophysa* Hagen, 1867. In San Luis, we provided records for 10 newly recorded species: *Hetaerina rosea* Selys, 1853, *Acanthagrion lancea* Selys, 1876, *Ischnura fluviatilis* Selys, 1876, *Oxyagrion rubidium* (Rambur, 1842), *Castoraeschna decurvata* Dunkle & Cook, 1984, *Rhionaeschna pallipes* (Fraser, 1947), *Phyllocycla argentina* (Hagen in Selys, 1878), *Erythrodiplax corallina* (Brauer, 1865), *Perithemis mooma* Kirby, 1889, and *Planiplax erythropyga* (Karsch, 1891). Among these records, we extend the geographic distribution of *A. peterseni* and *R. pallipes*, which are endemic to Argentina and recorded *P. erythropyga* for the first time in Chaco phytogeographic province.

Key words

Anisoptera, Insecta, new records, South America, Zygoptera.

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Introduction

The order Odonata (dragonflies and damselflies) is a relatively small group of insects with approximately 5952 extant species (Dijkstra et al. 2013). In Argentina, more than 280 species were recorded (von Ellenrieder and Muzón 2008). There are several areas of the country where the odonate fauna is poorly known, for example, San Luis province where the knowledge of the order

consists of isolated records of 10 species (von Ellenrieder and Muzón 2008, Lozano et al. 2017). Other provinces, like Córdoba, are partially sampled; there is information for the northern Chaco biogeographic province (von Ellenrieder 2010, Lozano and Anjos-Santos 2012) and a list of the fauna of the Suquia River (Zapata and Pereyra 2016), but there is a lack of data from the southern region of the province.

Intensive agricultural activity and the increasing

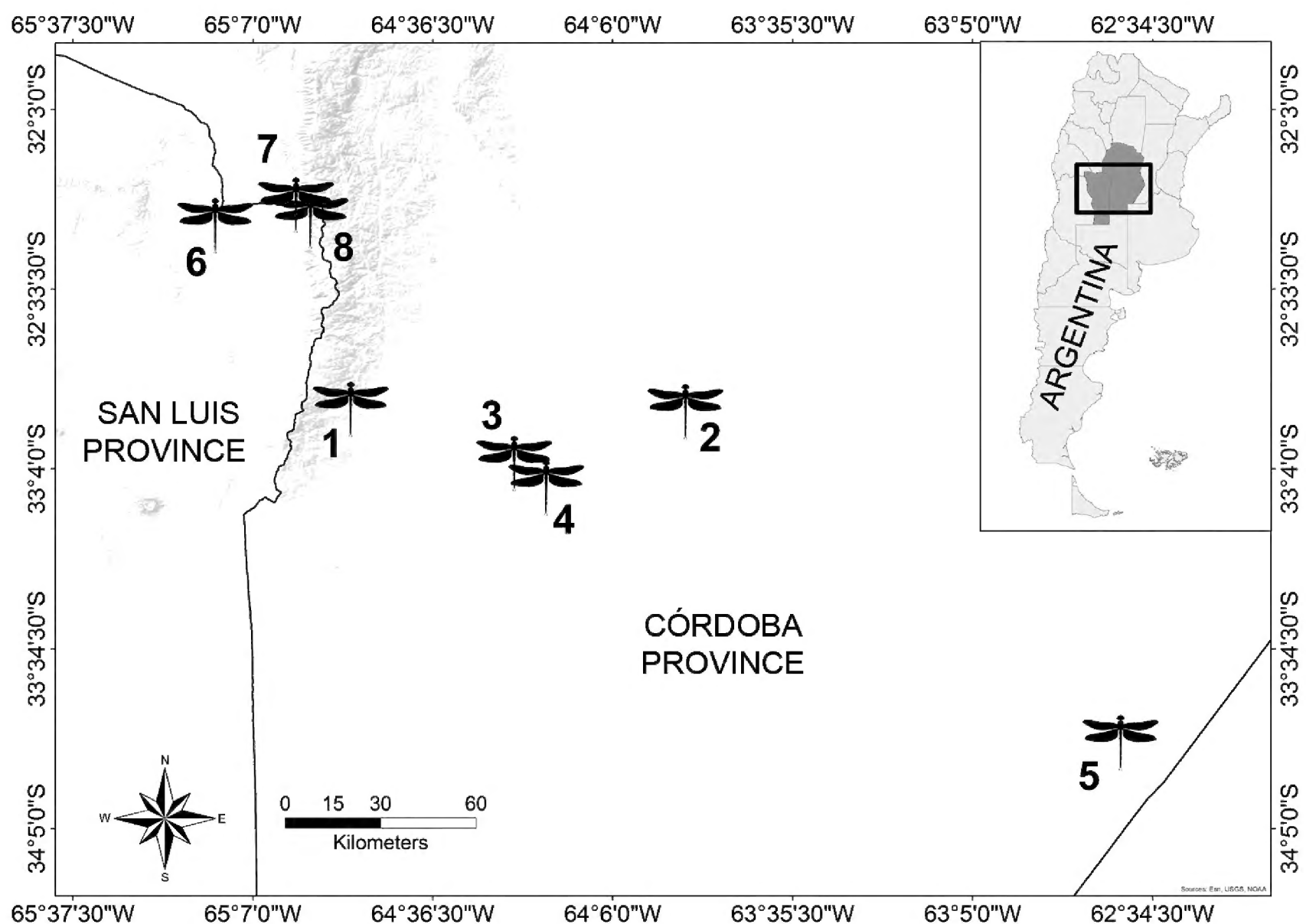


Figure 1. Map showing the sampling sites for Odonata specimens in Córdoba and San Luis provinces.

use of agrochemicals jeopardize biodiversity and the ecosystem services in central Argentina (Bedano et al. 2011). The marked phenomenon of “agriculturization” was encompassed by the channelization of rivers and wetlands to stop flooding and to increase area for agriculture (Brandolin et al. 2013). As habitat loss is the major threat for biodiversity (Hanski 2011), the need to improve the knowledge of the fauna that inhabits central Argentina is urgent. Odonates are recognized worldwide as good indicators of the health (Oertli 2008) and integrity of aquatic ecosystems (Simaika and Samways 2012). Moreover, the odonate life cycle, with aquatic larvae and terrestrial adults, makes this order of insects a good indicator of disturbances in both aquatic and terrestrial ecosystems (Oertli 2008).

In this context, increasing the knowledge about the distribution of odonates in central Argentina will be useful information for further biomonitoring of aquatic and terrestrial ecosystems. Our aim was to report the species richness of odonates from Córdoba and San Luis provinces using literature and to provide novel geographical distribution records of several species documented in our fieldwork.

Methods

Study area. The study area is in southern Córdoba province and in north-eastern San Luis province. Córdoba is one of the largest provinces of Argentina at 165,621 km² and belongs to the Central region of the country. San Luis province is 76,748 km² and is located in the Cuyo

region. Our fieldwork was done in the Pampa, Espinal, and Chaco phytogeographic provinces (Oyarzabal et al. 2018). Specimens were collected in 5 sites (Fig. 1) in Córdoba and in 3 sites of San Luis, which included streams and ponds as follows:

Site 1. Piedras Blancas Stream, Las Albahacas, Córdoba (32°53'49" S, 064°50'24" W, altitude: 738 m a.s.l). The dominant vegetation is xerophytic woodland with *Schinopsis marginata* Engl. and is located within the Chaco phytogeographic province (Oyarzabal et al. 2018). Numerous patches of *Cortaderia selloana* (Schult. & Schult. f.) Asch. & Graebn. subsp. *selloana* can be found at the riparian area, and emergent macrophytes are abundant in stream habitats with low current velocity. The stream flow is turbulent and the substrate is dominated by boulders and cobbles with pebbles and sand in less quantity. Stream margins are used for human recreation.

Site 2. Unnamed wetland, Carnerillo, Córdoba (32°54'14" S, 063°53'40" W, altitude: 283 m a.s.l). Located within Espinal phytogeographic province (Oyarzabal et al. 2018). Xerophytic woodland, with *Prosopis nigra* (Griseb.) Hieron. var. *longispina* Burkart and *Prosopis alba* Griseb. var. *alba*, is the dominant vegetation in the region (Oyarzabal et al. 2018). This ecosystem is a waterlogged grassland with many specimens of *Cortaderia selloana* and dispersed patches of *Schoenoplectus* sp. Substrate is entirely composed by silt. The main land use in this area is intensive agriculture.

Site 3. Unnamed pond, Rio Cuarto, Córdoba (33°03'01" S, 064°22'42" W, altitude: 471 m a.s.l). This ecosystem is an abandoned meander of the Chocancharava

River, and the vegetation in this site is xerophytic woodland, with *Prosopis nigra* and *Prosopis alba*, within Espinal phytogeographic province (Oyarzabal et al. 2018). The bottom of the pond is composed by silty substrates and has many areas with patches of *Typha* spp. The main activity in this area is extraction of sand and gravel for construction, and this wetland is also altered by fishing and hunting.

Site 4. Meandro pond, Rio Cuarto, Córdoba (33°07' 07" S, 64°17'18" W, altitude: 409 m a.s.l.). This ecosystem is an abandoned meander of the Chocancharava River and the vegetation in this site is xerophytic woodland with *Prosopis nigra* and *Prosopis alba*, within Espinal phytogeographic province (Oyarzabal et al. 2018). The bottom of the pond is composed by silty substrates and has many areas with patches of *Typha* spp. and *Cyperus* spp. Fishing and hunting are the main activities in the area that alter this wetland ecosystem.

Site 5. Unnamed pond, Alejo Ledesma, Córdoba (33°50'21" S, 62°39'55" W, altitude: 122 m a.s.l.). This pond is located in the pampean phytogeographic province (Oyarzabal et al. 2018). Vegetation around the pond is mainly composed by soybean crops. The shore is predominantly muddy with scarce aquatic vegetation (*Schoenoplectus* sp.).

Site 6. Santa Rosa Stream, Santa Rosa de Conlara, San Luis (32°22'41" S, 65°13'21" W, altitude: 601 m a.s.l.). The dominant vegetation is xerophytic woodland with *Aspidosperma quebracho-blanco* Schltdl. in transition with steppe and is located within the Chaco phytogeographic province (Oyarzabal et al. 2018). The stream flow is laminar and the substrate is dominated by silt. Pebble and sand are present in less quantity. Stream margins are used for cattle grazing.

Site 7. El Azud pond, Villa de Merlo, San Luis (32°19' 11" S, 64°59'41" W, altitude: 981 m a.s.l.). This environment is a human-made pond used for water storage. The dominant vegetation in the area is xerophytic woodland with *Schinopsis marginata* Engl. and is located within the Chaco phytogeographic province (Oyarzabal et al. 2018). Substrate is composed by cobbles and pebbles with a great deposition of silt in many areas. The area is used for cattle grazing and human recreation.

Site 8. Damiana Vega Stream, Villa de Merlo, San Luis (32°21'53" S, 64°57'14" W, altitude: 1238 m a.s.l.). The dominant vegetation is xerophytic woodland with *Schinopsis marginata* Engl. and is located within the Chaco phytogeographic province (Oyarzabal et al. 2018). The stream flow is turbulent, and the substrate is dominated by bedrock, boulders, and cobbles with pebbles and sand in less quantity. Stream margins are used for human recreation.

Data collection. Adult odonates were captured using aerial nets, stored in paper envelopes and soaked in acetone for 24 h. Identification were based on specialized keys (Ris 1911, Williamson 1923, Borror 1942, Leonard 1977, Costa 1978, De Marmels and Rácenis 1982, Belle

1988, Garrison 1990, von Ellenrieder and Muzón 1999, 2006, Muzón and von Ellenrieder 2001, Garrison et al. 2006, von Ellenrieder and Garrison 2007, von Ellenrieder 2008) and species descriptions (Calvert 1906, 1909, Ris 1912, Borror 1942, Leonard 1977, Costa 1978, Dunkle and Cook 1984, Muzón 1993, von Ellenrieder and Muzón 1999, 2006, Muzón and von Ellenrieder 2001, von Ellenrieder 2008). All the specimens collected were deposited at the Zoología de Invertebrados collection of the Universidad Nacional de Río Cuarto (UNRC-ZIIO, Córdoba, Argentina).

Results

A total of 55 species of Odonata were recorded, corresponding to 19 new geographical distribution records in central Argentina. Nine species are newly recorded for Córdoba province and 10 are new for San Luis province, reaching a total number of 52 and 20 species per province, respectively (Table 1). These species belong to 6 families: Calopterygidae, Lestidae, Coenagrionidae, Aeshnidae, Gomphidae, and Libellulidae. One of these families (Lestidae) is newly recorded for Córdoba and 3 (Calopterygidae, Aeshnidae and Gomphidae) are newly recorded for San Luis. A check list of the odonate species from Córdoba and San Luis, with bibliographical references, is provided in Table 1. An annotated list is presented below of the species with important new records, with comments on the identification of these species and material examined.

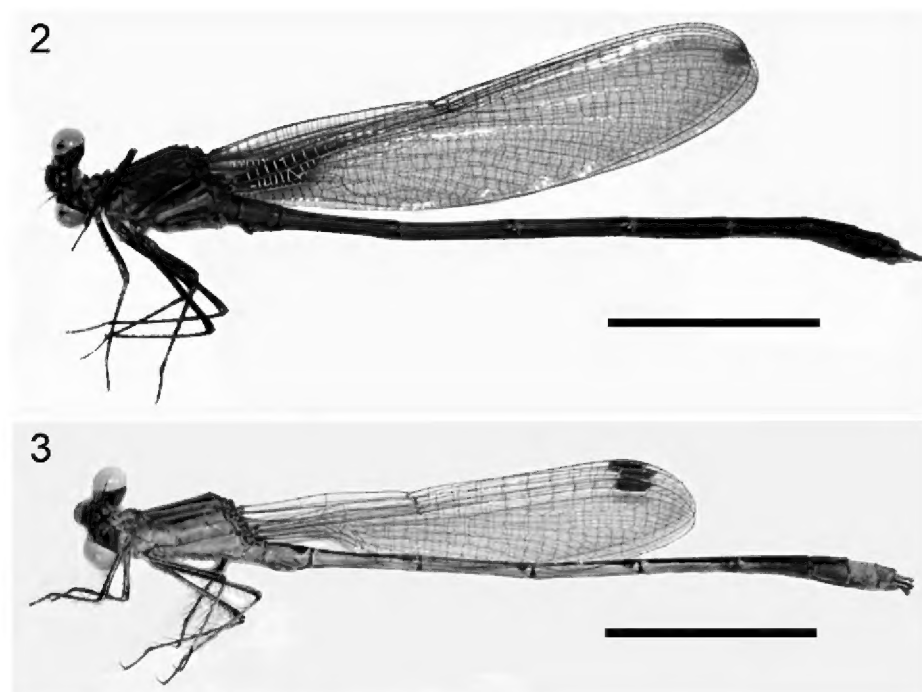
Zygoptera

Calopterygidae

Hetaerina rosea Selys, 1853

Figure 2

Material examined. 1 male Site 6, J.A. Márquez col. 18-I-2018 (UNRC-ZIIO 0177) and 1 male Site 6, J.A. Márquez col. 21-I-2018 (UNRC-ZIIO 0179).



Figures 2, 3. New records of Odonata species for Argentine provinces. **2.** New record from San Luis: *Hetaerina rosea*, habitus. Male from site 6. **3.** New record from Córdoba: *Lestes spatula*, habitus scan. Male from site 2. Scale bars = 1 cm.

Table 1. Check list for the 55 species of dragonflies recorded from Córdoba and San Luis provinces. Numbers correspond to the bibliographical references that document the presence of the species in the province. The Argentinean checklist was used as the start point (1. von Ellenrieder and Muzón 2008) and posterior records for the provinces are also shown: 2. von Ellenrieder 2010, 3. Lozano and Anjos Santos 2012, 4. Muzón et al. 2014, 5. Zapata and Pereyra 2016 and 6. Lozano et al. 2017. NR indicates a new record for the province and the dash (–) means that the species was not recorded for the province.

Taxon	Córdoba	San Luis	Taxon	Córdoba	San Luis
ZYGOPTERA			<i>Progomphus joergenseni</i> Ris, 1908	1–6	–
CALOPTERYGIDAE			LIBELLULIDAE		
<i>Hetaerina rosea</i> Selys, 1853	1	NR	<i>Dasythemis mincki clara</i> Ris, 1908	1	1
LESTIDAE			<i>Diastatops intensa</i> Montgomery, 1940	1	–
<i>Lestes spatula</i> Fraser, 1946	NR	–	<i>Diastatops obscura</i> (Fabricius, 1775)	1	–
COENAGRIONIDAE			<i>Dythemis nigra</i> (Martin, 1897)	–	1
<i>Acanthagrion hildegarda</i> Gloger, 1967	1–3	–	<i>Erythemis attala</i> (Selys, 1857)	NR	–
<i>Acanthagrion floridense</i> Fraser, 1946	1	6	<i>Erythemis mithroides</i> (Therese in Brauer, 1900)	1	–
<i>Acanthagrion lancea</i> Selys, 1876	5	NR	<i>Erythemis plebeja</i> (Burmeister, 1839)	NR	–
<i>Andinagrion peterseni</i> (Ris, 1908)	NR	–	<i>Erythemis vesiculosa</i> (Fabricius, 1775)	1–2	–
<i>Argentagrion ambiguum</i> (Ris, 1904)	NR	–	<i>Erythrodiplax atroterminata</i> Ris, 1911	1–5	1
<i>Argia joergenseni</i> Ris, 1913	1–2–6	1	<i>Erythrodiplax corallina</i> (Brauer, 1865)	1	NR
<i>Cyanallagma bonariense</i> (Ris, 1913)	1	–	<i>Erythrodiplax media</i> Borrer, 1942	NR	–
<i>Ischnura fluviatilis</i> Selys, 1876	1–5	NR	<i>Erythrodiplax nigricans</i> (Rambur, 1842)	5	–
<i>Ischnura ultima</i> Ris, 1908	1–4	–	<i>Erythrodiplax paraguayensis</i> (Förster, 1905)	1	–
<i>Oxyagrion ablutum</i> Calvert, 1909	1	–	<i>Erythrodiplax umbrata</i> (Linnaeus, 1758)	5	–
<i>Oxyagrion bruchi</i> Navás, 1924	1	–	<i>Macrothemis imitans</i> Karsch, 1890	1–5	–
<i>Oxyagrion chapadense</i> Costa, 1978	1	–	<i>Miathyria marcella</i> (Selys in Sagra, 1857)	5	–
<i>Oxyagrion hempeli</i> Calvert, 1909	1	–	<i>Micrathyria hypodidyma</i> Calvert, 1906	1	–
<i>Oxyagrion rubidum</i> (Rambur, 1842)	1	NR	<i>Micrathyria longifasciata</i> Calvert, 1909	NR	–
<i>Telebasis willinki</i> Fraser, 1948	5	–	<i>Micrathyria unguolata</i> Förster, 1907	1	1
ANISOPTERA			<i>Orthemis discolor</i> (Burmeister, 1839)	–	1
AESHNIDAE			<i>Orthemis nodiplaga</i> Karsch, 1891	5	1
<i>Castoraeschna decurvata</i> Dunkle & Cook, 1984	1	NR	<i>Pantala flavescens</i> (Fabricius, 1798)	5	1
<i>Coryphaeschna perrensi</i> (McLachlan, 1887)	1	–	<i>Pantala hymenaea</i> (Say, 1839)	5	–
<i>Rhionaeschna absoluta</i> (Calvert, 1952)	1	–	<i>Perithemis mooma</i> Kirby, 1889	1	NR
<i>Rhionaeschna bonariensis</i> (Rambur, 1842)	1	–	<i>Planiplax erythropyga</i> (Karsch, 1891)	–	NR
<i>Rhionaeschna confusa</i> (Rambur, 1842)	1	–	<i>Sympetrum gilvum</i> (Selys, 1884)	1	1
<i>Rhionaeschna pallipes</i> (Fraser, 1947)	1	NR	<i>Tauriphila risi</i> Martin, 1896	1–2	–
<i>Rhionaeschna planaltica</i> (Calvert, 1952)	1	–	<i>Tremea cophysa</i> Hagen, 1867	NR	–
GOMPHIDAE			Total new records	9	10
<i>Phyllocycla argentina</i> (Hagen in Selys, 1878)	5	NR	Total number of species	52	20
<i>Progomphus aberrans</i> Belle, 1973	1	–			

Identification. This species is characterized by the posterior end of median lobe of the cercus meeting the superior ridge at a right angle, and by the length of median lobe which is approximately equal to the distal 0.33 of cercus. The distal process of the paraproct bears a slight, medially directed blunt tooth which occupies the distal 0.10 of the appendage (Garrison 1990: fig. 30). This last character allows for the separation of *H. rosea* from *H. mendezi*, which is similar and also found in Argentina; *H. mendezi* has the posterior 0.20 of the distal process of the paraproct forming a strong 90 degree recurved tooth (Garrison 1990).

Lestidae

Lestes spatula Fraser, 1946

Figure 3

Material examined. 3 males Site 2, J.A. Márquez and P.G. Brandolin cols. 1-XII-2016 (UNRC-ZIIO 0395, 0396, 0397).

Identification. This species can be distinguished from other *Lestes* species in Argentina in having a minute spot at the end of each latero ventral carina at the venter of the pterothorax and in having the mesepisternal stripe 0.33 as wide as the mesepisternum. The cercus is straight in lateral view, and its inner margin has only a basal tooth. The paraprocts are as long as the cerci and have a basal inner carina. The internal lobe of penis is half as wide as the second segment, the small anterior portion is grooved anteriorly, and the posterior portion is reniform and bilobated (Muzón 1993: figs 12, 13, 16).

Coenagrionidae

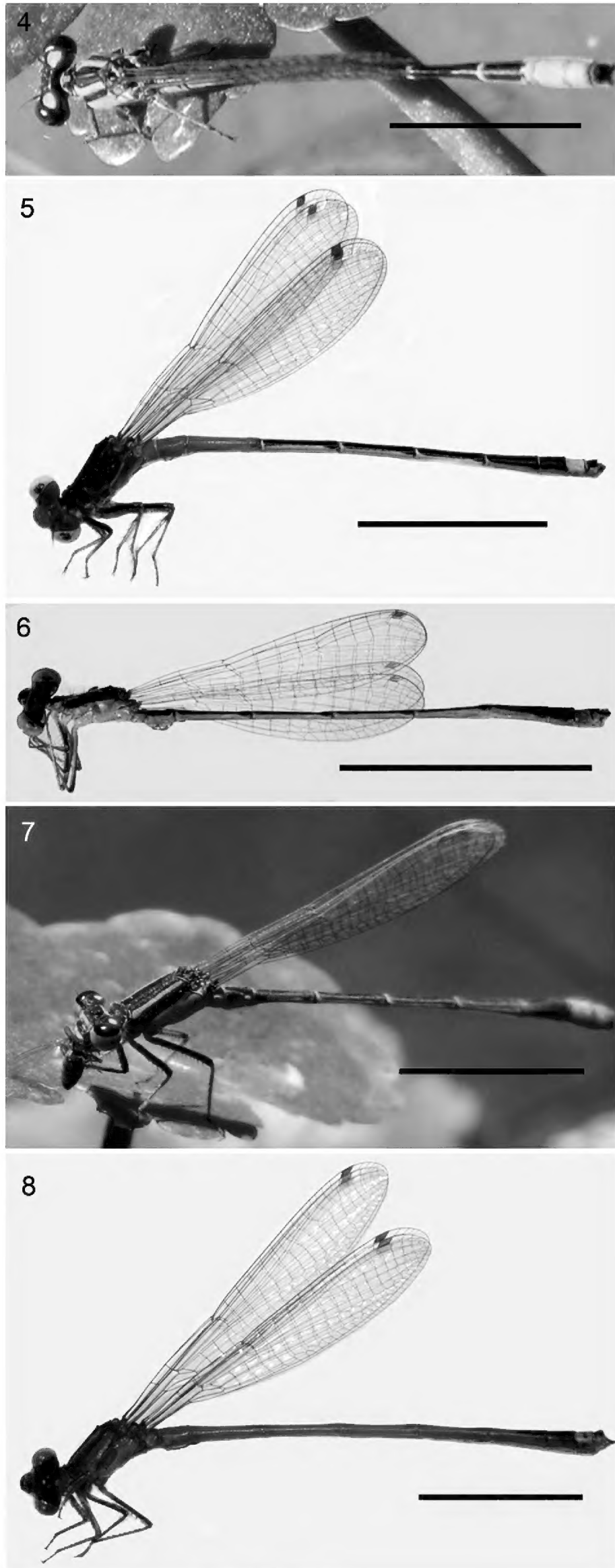
Acanthagrion lancea Selys, 1876

Figure 4

Material examined. 1 male Site 7, J.A. Márquez col. 8-I-2018 (UNRC-ZIIO 0224).

Identification. This species belongs to the Viridescens group, which is characterized by the double transverse

fold on the ental surface of the distal penis segment, the subbasal and subapical constrictions and dorsal tubercles on the male cercus, and the absence of a dark stripe



Figures 4–8. New records of Odonata species for Argentine provinces. **4.** New record from San Luis: *Acanthagrion lancea*, field photograph. Male from site 7. **5.** New record from Córdoba: *Andinagrion peterseni*, habitus. Male from site 4. **6.** New record from Córdoba: *Argentagrion ambiguum*, habitus. Male from site 5. **7.** New record from San Luis: *Ischnura fluviatilis*, field photograph. Male from site 7. **8.** New record from San Luis: *Oxyagrion rubidum*, habitus. Male from site 6. Scale bars = 1 cm.

along the second lateral thoracic suture. The Viridescens group is represented by 3 species in Argentina; among them *A. lancea* can be distinguished in having the distal segment of the penis broad and expanded at distal tip, the hollow lateral lobes of distal penis segment plainly visible from below overlapping lateral margins of segment 2, and the dorsal tubercle of the cercus weakly developed (Leonard 1977: figs 43, 44)

***Andinagrion peterseni* (Ris, 1908)**

Figure 5

Material examined. 1 male Site 4, J.A. Márquez col. 21-XI-2017 (UNRC-ZIIO 0230).

Identification. This species differs from other species of *Andinagrion* in males by having the dorsum of abdominal segment 7 black and the cercus about as wide as 0.83–0.9 of its length in posteromedial view (von Ellenrieder and Muzón 2006: figs 1h, 10b).

***Argentagrion ambiguum* (Ris, 1904)**

Figure 6

Material examined. 1 male and 1 female (in tandem) Site 5, J.A. Márquez col. 15-II-2017 (UNRC-ZIIO 0238).

Identification. This species can be distinguished from the other *Argentagrion* species by the broadly bilobate posterior lobe of the prothorax in both sexes and the male cercus about twice as long as wide in dorsal view. The dorsal branch of the male paraproct is rounded and the dorsum of abdominal segments 3–8 is mostly black (von Ellenrieder 2008: figs 21, 23, 58, 66, 67).

***Ischnura fluviatilis* Selys, 1876**

Figure 7

Material examined. 1 male Site 7, J.A. Márquez col. 8-I-2018 (UNRC-ZIIO 0339).

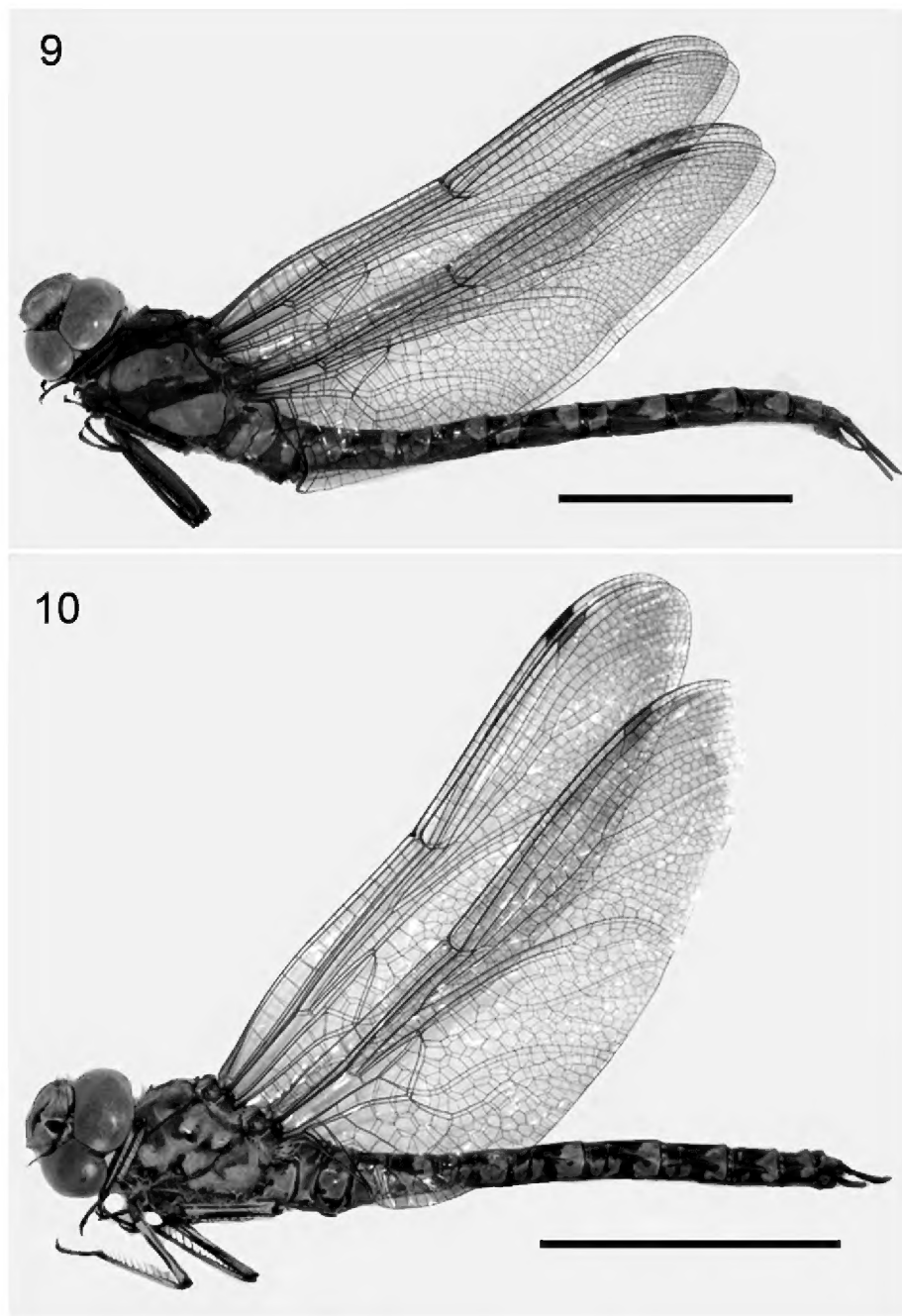
Identification. This species can be distinguished from the other 2 species of *Ischnura* in Argentina in having the outer branch of the male cercus shorter than the inner branch (von Ellenrieder and Garrison 2007: fig. 95).

***Oxyagrion rubidum* (Rambur, 1842)**

Figure 8

Material examined. 2 males and 1 female (1 pair in tandem) Site 6, J.A. Márquez col. 18-I-2018 (UNRC-ZIIO 0391, 0392).

Identification. This species can be distinguished from the other *Oxyagrion* species in Argentina by the following combination of characters: dorsum of abdominal segment 8 black and segment 9 blue in males, the male cercus with a bifid tip and depressed in lateral view, and the genital ligula with long lateral lobes on each side and a v-shaped cleft on the apical margin. The mesepisternal interlaminal sinus of females is approximately rectangular (Costa 1978: figs 83, 84).



Figures 9, 10. New records of Odonata species for Argentine provinces. **9.** New record from San Luis: *Castoraeschna decurvata*, habitus. Male from site 6. **10.** New record from San Luis: *Rhionaeschna pallipes*, habitus. Male from site 8.

Anisoptera
Aeshnidae

***Castoraeschna decurvata* Dunkle & Cook, 1984**

Figure 9

Material examined. 1 male Site 6, J.A. Márquez col. 21-I-2018 (UNRC-ZIIO 0004).

Identification. According to the species description, *C. decurvata* is characterized by the absence of the T-spot on the postfrons; the male cercus decurved in lateral view and with a low inferior prominence. In the pterothorax, the antehumeral (mesepisternal) green stripe is 2 mm wide at mid-height and the mesothoracic (mesepimeral) green stripe is wider than adjacent posterior brown stripe (Dunkle and Cook 1984: figs 1, 2).

***Rhionaeschna pallipes* (Fraser, 1947)**

Figure 10

Material examined. 1 male Site 8, J.A. Márquez col. 14-I-2018 (UNRC-ZIIO 0026).

Identification. This species belongs to the *Marmaraeschna* group, which is characterized by the marbled pattern of black markings and pale areas on the pterothorax. Among the 7 species in this group, *R. pallipes*

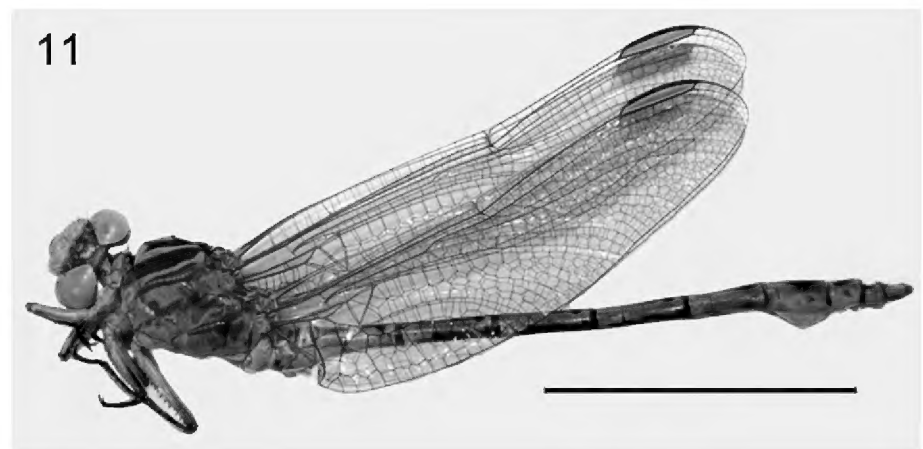


Figure 11. New records of Odonata species for Argentine provinces. New record from San Luis: *Phyllocycla argentina*, habitus scan. Male from site 6.

is distinguished by its linear frontal carina (Muzón and von Ellenrieder 2001).

Gomphidae

***Phyllocycla argentina* (Hagen in Selys, 1878)**

Figure 11

Material examined. 1 male Site 6, J.A. Márquez col. 18-I-2018 (UNRC-ZIIO 0030).

Identification. This species can be distinguished from the other species of its genus by having the apical inferior angles of abdominal segment 10 not produced inward and downward. The inferior margin of the cercus has a plate-like downward expansion just beyond the base, and the upper carinate margin bears a tooth, or strong angulation, between the base and the point where the cercus changes its direction. The first pale antehumeral stripe widens anteriorly and becomes confluent with the pale mesothoracic “half collar”. The lateral dilatation of abdominal segment 8 is broad and widest mid-length on the segment, and the lateral dilatation of segment 9 is one-third as wide as that of segment 8. The truncated tip of posterior hamule is 2-pointed (Belle 1988).

Libellulidae

***Erythemis attala* (Selys in Sagra, 1857)**

Figure 12

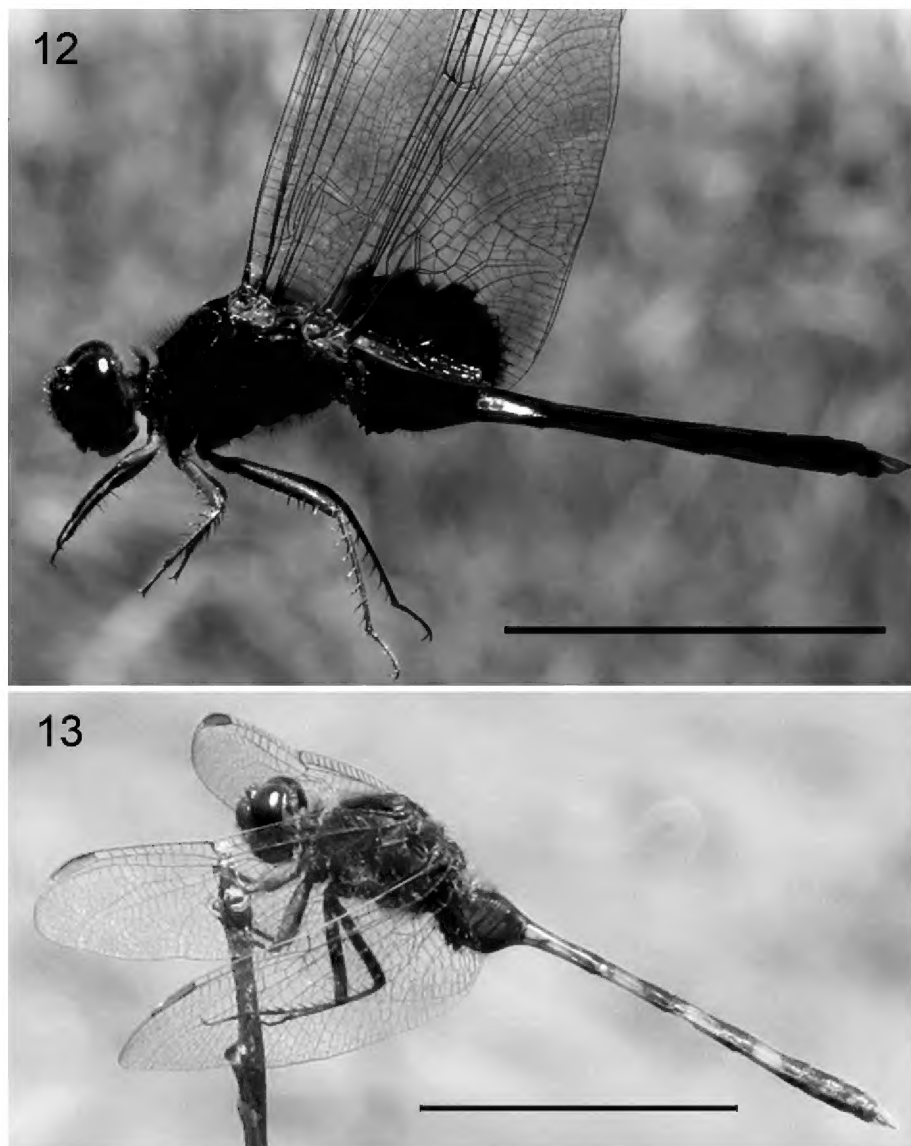
Material examined. 1 male Site 3, D.E. Berejnoi col. 20-XII-2017 (UNRC-ZIIO 0040).

Identification. This species can be distinguished from the other species of *Erythemis* in Argentina by the lateral and ventral carinas of abdominal segment 4 separated by a distance equal to or less than one-fourth the length of the lateral carina, the thorax and abdomen are black in mature males, and the black basal spot on hind wings reaches beyond the cubito anal (CuP-crossing) cross vein (Williamson 1923).

***Erythemis plebeja* (Burmeister, 1839)**

Figure 13

Material examined. 1 male Site 1, J.A. Márquez col. 19-X-2014 (UNRC-ZIIO 0041).



Figures 12, 13. New records of Odonata species for Argentine provinces. **12.** New record from Córdoba: *Erythemis attala*, field photograph. Male from site 3. **13.** New record from Córdoba: *Erythemis plebeja*, field photograph. Male from site 1.

Identification. This species can be distinguished from the other species of *Erythemis* in Argentina by the thorax and abdomen dorsum of segments 5–10 predominantly black, the presence of a black basal spot on the hind wings, the lateral and ventral carinas of abdomen segment 4 separated by a distance less than one-sixth the length of the lateral carina, and the external branch of the hamule rounded and ventrally directed in males (Williamson 1923).

Erythrodiplax corallina (Brauer, 1865)

Figure 14

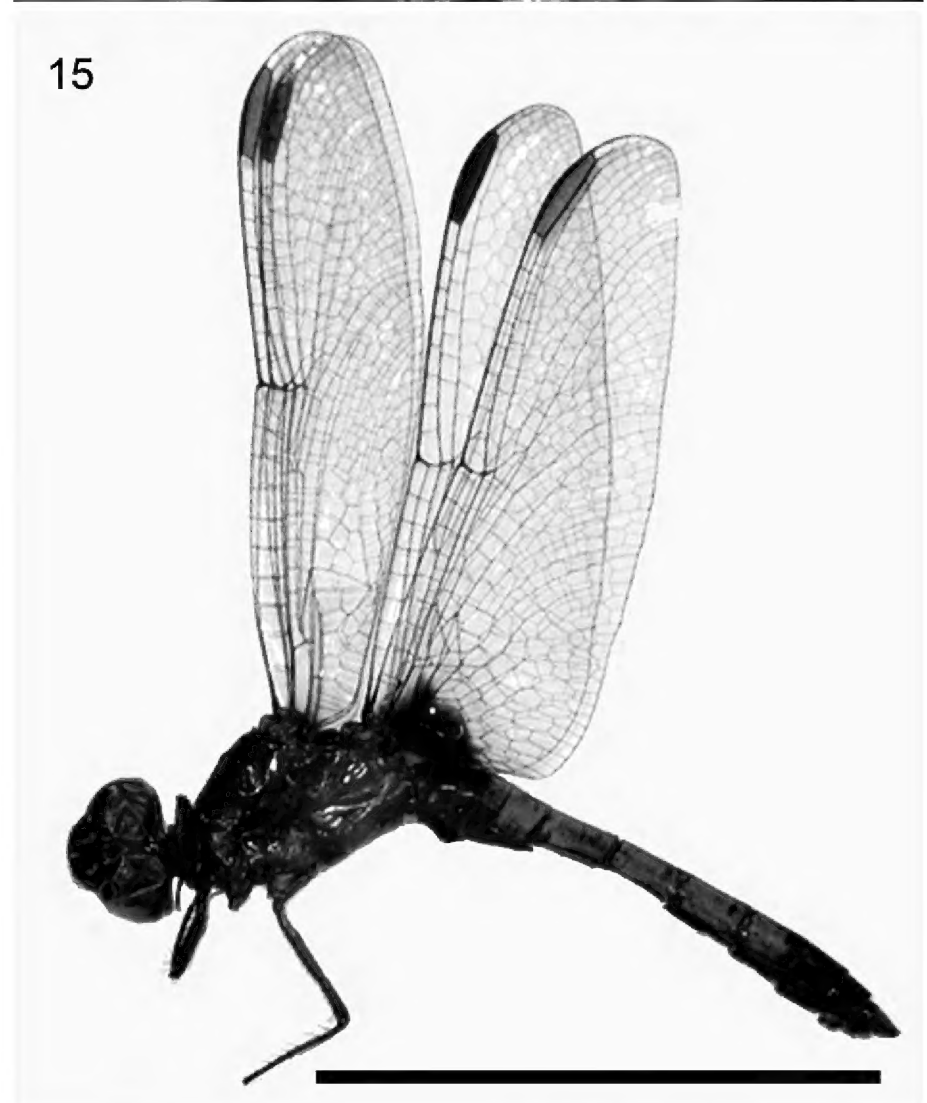
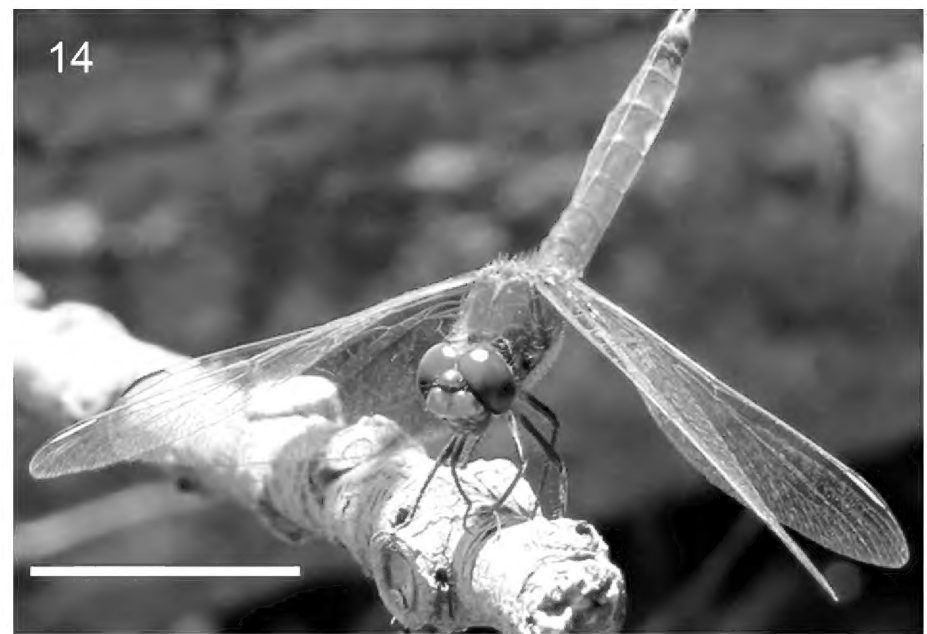
Material examined. 1 male Site 6 J.A. Márquez col. 18-I-2018 (UNRC-ZHIO 0093) and 1 male and 1 female (in tandem) Site 6, J.A. Márquez col. 21-I-2018 (UNRC-ZHIO 0094).

Identification. This species can be distinguished from others of its genus by the frons reddish or brownish, the thorax with a comma-shaped black mark extending across the metepisternum below the spiracle, the large basal orange spot on its hind wings, and the abdomen reddish except segments 8–10 which have black spots (Borror 1942).

Erythrodiplax media Borror, 1942

Figure 15

Material examined. 1 male Site 1 J.A. Márquez col. 19-X-2014 (UNRC-ZHIO 0095).



Figures 14, 15. New records of Odonata species for Argentine provinces. **14.** New record from San Luis: *Erythrodiplax corallina*, field photograph. Male from site 6. **15.** New record from Córdoba: *Erythrodiplax media*, habitus. Male from site 1.

Identification. This species can be distinguished from other species of its genus by the dark blue frons and body of adults, the terminal segment of penis in profile gradually widened distally and with its lateral lobes triangular and median process very slender, the wing tips hyaline, and the basal spot on hind wings small and extending at most to half way between first and second antenodals (Borror 1942: figs 66, 159).

Micrathyria hypodidyma Calvert, 1906

Figure 16

Material examined. 1 male Site 3, R.E. Principe col. 20-XII-2017 (UNRC-ZHIO 0126) and 2 males Site 4, J.A. Márquez col. 6-III-2018 (UNRC-ZHIO 0130, 0131).

Identification. This species can be distinguished from other *Micrathyria* species by having 2 cells between the anal angle of the triangle and the Cuspl in the hind wing,

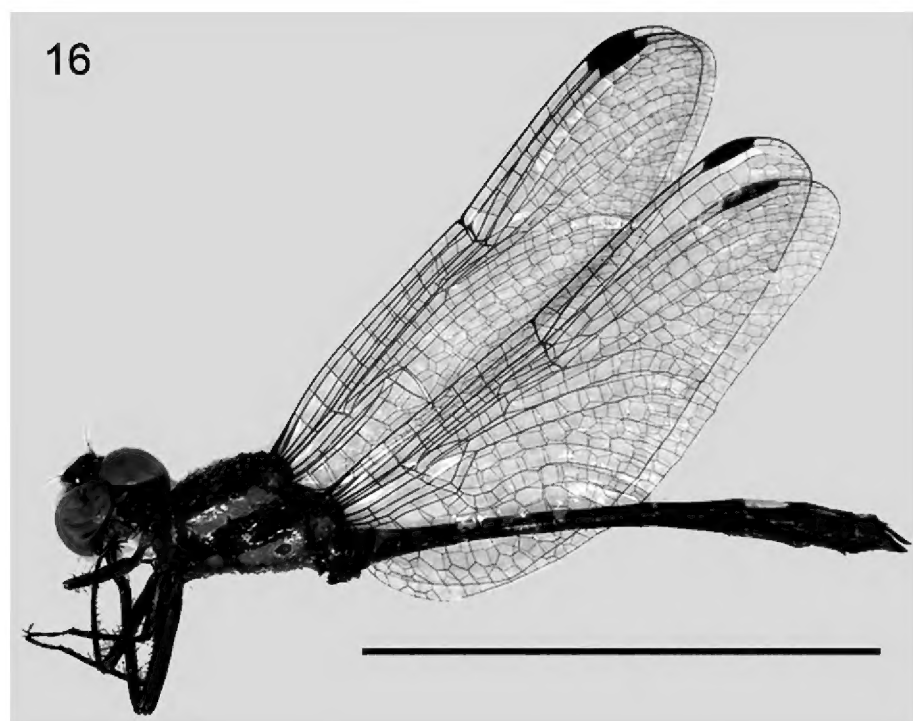


Figure 16. New records of Odonata species for Argentine provinces. New record from Córdoba: *Micrathyria hypodidyma*, habitus. Male from site 3.

the arculus located at level of the second antenodal, or very close to it, and 2 linear wide pale stripes at the sides of the pterothorax. In males, the hamule projects anteriorly, not surpassing the proximal margin of the anterior lamina, and the cercus in lateral view is approximately linear (Calvert 1906).

The 3 specimens collected in Córdoba presented variations in wing venation, especially noticeable in the fore wing triangles (Fig. 17). Specimen UNRC-ZIIO 0130 displayed free triangles in its fore wings, whereas specimen UNRC-ZIIO 0131 displayed crossed triangles in its fore wings. The last specimen UNRC-ZIIO 0126 presented asymmetry in fore wing triangles, displaying the left fore wing triangle crossed and the right fore wing triangle free.

Micrathyria longifasciata Calvert, 1909

Figure 18

Material examined. 1 male Site 4, J.A. Márquez and R.E. Principe cols. 21-XI-17 (UNRC-ZIIO 0135).

Identification. This species can be distinguished from other species of its genus in Argentina by having the hind wings with 1 cell between anal angle of triangle and Cuspl; the fore wings with discoidal and subtriangle free; the pterothorax with 1 pale green oblique stripe running from the anterodorsal edge of the metepisternum to the posteroventral edge of the metepimeron (Calvert 1909, Ris 1911).

Perithemis mooma Kirby, 1889

Figure 19

Material examined. 2 males Site 7, J.A. Márquez col. 8-I-2018 (UNRC-ZIIO 0159, 0160).

Identification. This species can be distinguished from other species of its genus in Argentina by having 2 diffuse dark stripes on the lateral sutures of the pterothorax, the tip of the hamule is nearly 0.40 from ventral margin,

and the margins of the penis have a sclerotized distal portion of fourth segment parallel and basal portion trapezoidal (von Ellenrieder and Muzón 1999: figs 7, 8).

Planiplax erythropyga (Karsch, 1891)

Figure 20

Material examined. 1 male Site 7, J.A. Márquez col. 8-I-2018 (UNRC-ZIIO 0161).

Identification. Mature males have metallic blue postfrons and abdomen with a combination of blue on basal segments 1–5 and red on segments 6–10. Males also have an entire anterior lamina, and the posterior hamule is not bifid (Ris 1912, Garrison et al. 2006).

Tramea cophysa Hagen, 1867

Figure 21

Material examined. 1 male and 1 female (in tandem) Site 3, D.E. Berejnoi col. 20-XII-2017 (UNRC-ZIIO 0164).

Identification. This species belongs to the Cophysa group, which comprises 4 species with the common characteristic of having 2 oblique pale lateral bands on the synthorax. *Tramea cophysa* can be distinguished from other species of the Cophysa group by its dark brown to blackish basal spot of the hind wings; this spot extends to the CuP at most and usually there is no trace of it on fore wings. The dorsal portion of the frons is entirely metallic violet in males, and in females there is a posterior broad metallic violet stripe (De Marmels and Rácenis 1982).

Discussion

Our work provides new distributional data for 19 species of Odonata in 2 poorly sampled provinces of Argentina. This represents an increment of 17% of the number of species for Córdoba and 50% for San Luis. In addition, we provide new distributional records for families in San Luis (Calopterygidae, Aeshnidae, and Gomphidae) and Córdoba (Lestidae), showing that our study areas were previously unexplored for odonates.

Although most of the species that we newly recorded from Córdoba and San Luis are present in surrounding provinces, we have obtained some remarkable records. We provide information about the occurrence of *R. palipes* in San Luis and *A. peterseni* in Córdoba. These records are particularly important because they improve the knowledge of the geographic distribution of these Argentine endemics (Muzón and von Ellenrieder 2001, von Ellenrieder and Muzón 2006). Moreover, we extend the western limit of the distribution of *C. decurvata*, a specialist aeshnid, which was previously recorded from only 2 provinces of Argentina (Córdoba and Entre Ríos) and southern Brazil (Dalzochio et al. 2018). Another important species recorded from San Luis is *P. erythropyga*. This species was previously known in the Espinal phytogeographic province of Argentina (Buenos Aires

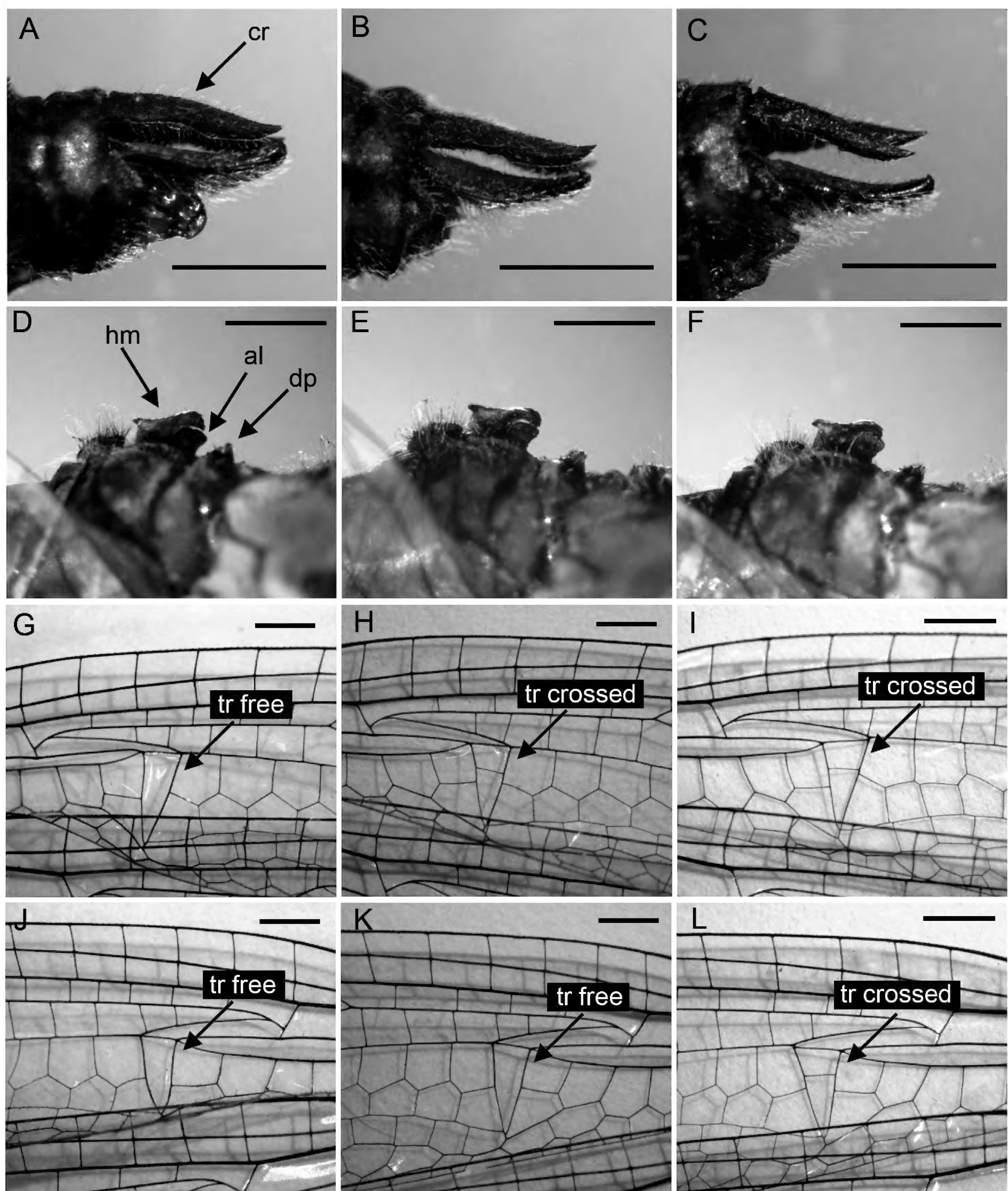


Figure 17. Characters used to the identification of three males of *Micrathyria hypodidyma*. **A–C.** cercus. **D–F.** genital fossa. **G–I.** left fore wing. **J–L.** right fore wing. Specimens UNRC-ZIIO: 0130 (**A, D, G, J**), 0126 (**B, E, H, K**), 0131 (**C, F, I, L**). al: anterior lamina, dp: dentate process, cr: cercus, hm: hamule, tr: triangle. Scale bars = 1 cm.

and Entre Ríos; von Ellenrieder and Muzón 2008). However, we recorded this species in the Chacoan biogeographic province and thereby greatly expanded its range to the west of Argentina.

We found variation in the wing venation of *M. hypodidyma*. Some of the existing identification keys to Argentine dragonflies use wing venation as one character to diagnose species of *Micrathyria* (von Ellenrieder and Garrison 2007), so identification must be done

cautiously. Nevertheless, the same keys also provide characters of genital fossa and cercus of males, which are more reliable for species identification.

As our fieldwork was done in southern Córdoba and northeastern San Luis, we expect additional species will be found in the future in other parts of these provinces. Our study area is subject to dramatic land use changes, mainly intensive agricultural activity and channelization of rivers and wetlands, which can make ecosystems

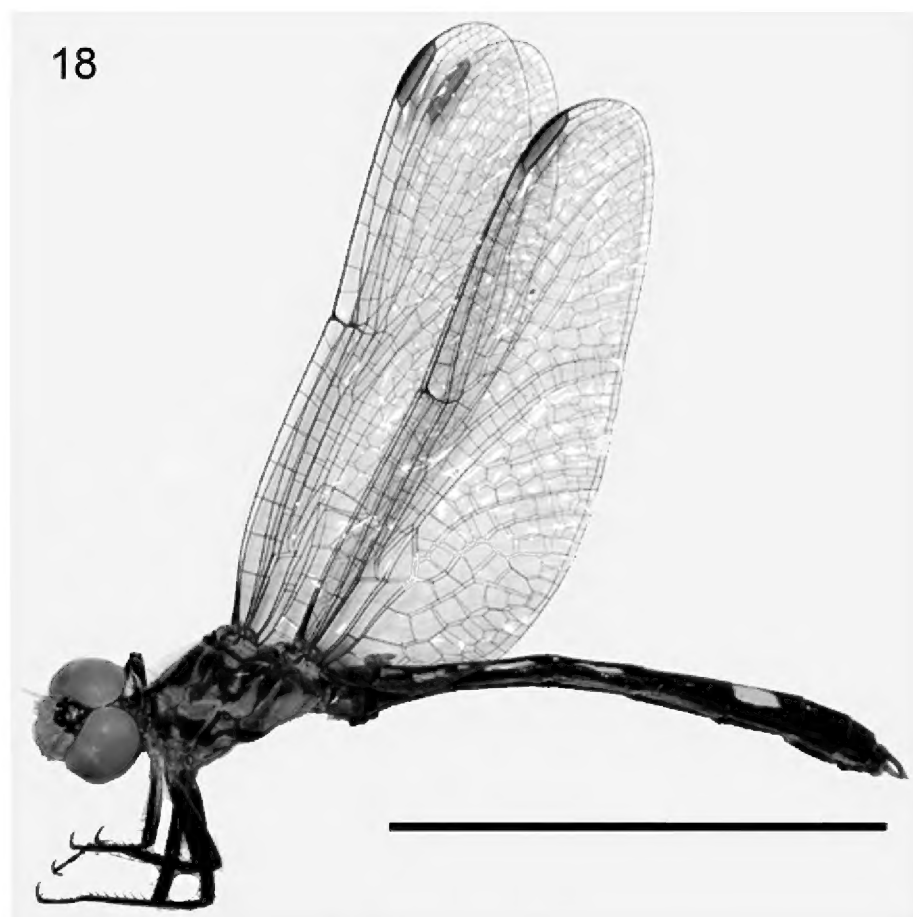


Figure 18. New records of Odonata species for Argentine provinces. New record from Córdoba: *Micrathyria longifasciata*, habitus. Male from site 4.

not suitable for dragonflies (Samways 2008). In that way, our results, which expand the geographic distribution of several species, may provide useful information for odonate conservation. Considering the great value of odonates as indicators of human disturbance, the check list of dragonflies and damselflies of Córdoba and San Luis is particularly important as a baseline for further bio-monitoring of ecosystems.

Acknowledgements

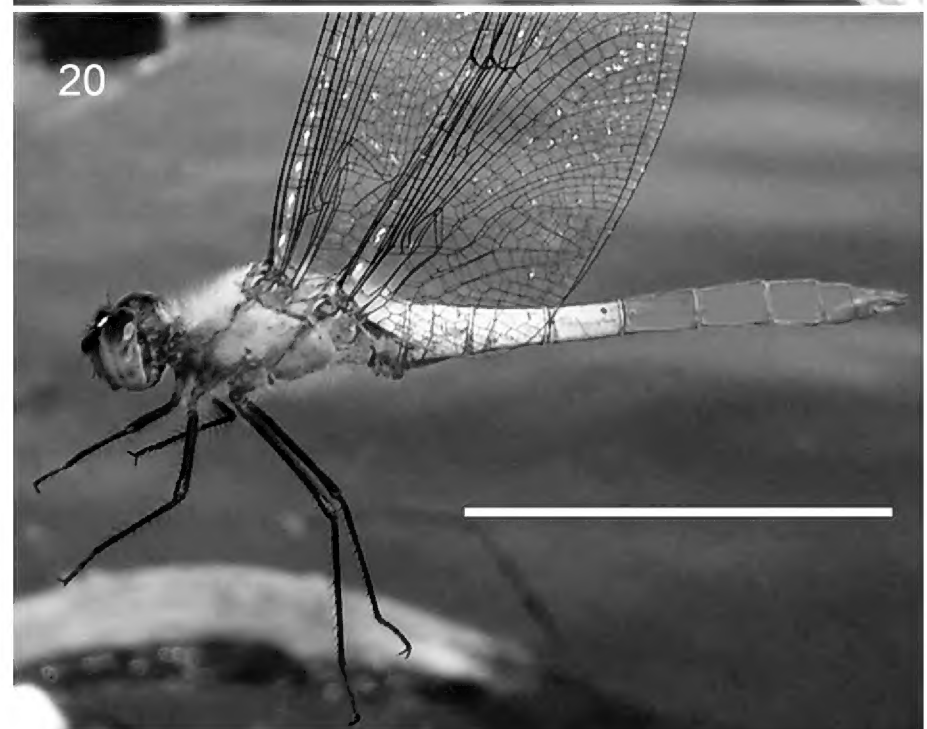
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Authors' Contributions

JM, JB and CM conceived the investigation. JM, RP, DB, JR and CM collected field data. JM and JR photographed the specimens. JM wrote the text.

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Figures 19, 20. New records of Odonata species for Argentine provinces. **19.** New record from San Luis: *Perithemis mooma*, field photograph. Male from site 7. **20.** New record from San Luis: *Planiplax erythropyga*, field photograph. Male from site 7.

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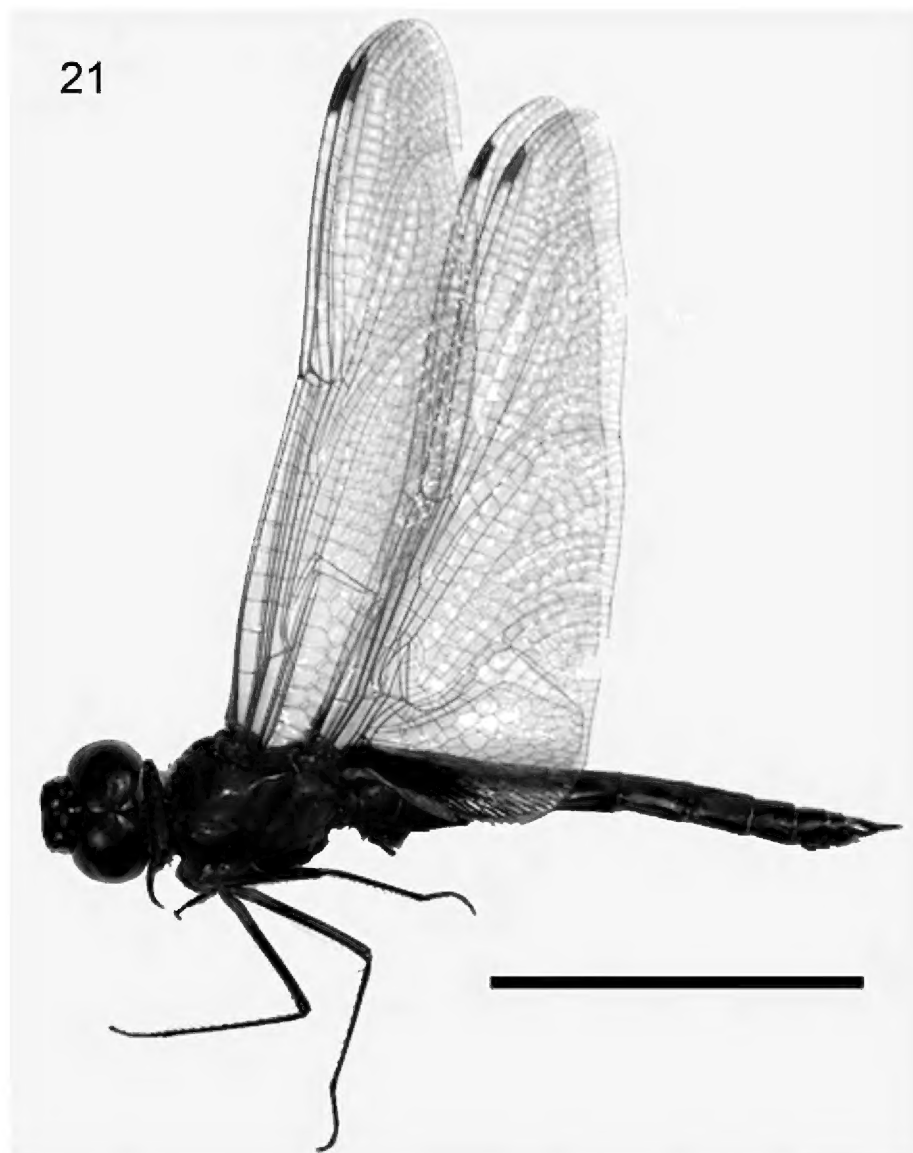


Figure 21. New record from Córdoba: *Tramea cophysa*, habitus. Male from site 3.

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